Biophysical regulation of stem cell behavior within the niche.

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Public Summary:
Stem cells reside within most tissues throughout the lifetimes of mammalian organisms. To maintain their capacities for division and differentiation and thereby build, maintain, and regenerate organ structure and function, these cells require extensive and precise regulation, and a critical facet of this control is the local environment or niche surrounding the cell. It is well known that soluble biochemical signals play important roles within such niches, and a number of biophysical aspects of the microenvironment, including mechanical cues and spatiotemporally varying biochemical signals, have also been increasingly recognized to contribute to the repertoire of stimuli that regulate various stem cells in various tissues of both vertebrates and invertebrates. For example, biochemical factors immobilized to the extracellular matrix or the surface of neighboring cells can be spatially organized in their placement. Furthermore, the extracellular matrix provides mechanical support and regulatory information, such as its elastic modulus and interfacial topography, which modulate key aspects of stem cell behavior. Numerous examples of each of these modes of regulation indicate that biophysical aspects of the niche must be appreciated and studied in conjunction with its biochemical properties.

Scientific Abstract:
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